10/660,950

PCT

(51) International Patent Classification 6 :	A1	(11) International Publication Number:	WO 98/43181
G06F 17/24		(43) International Publication Date:	1 October 1998 (01.10.98)

(21) International Application Number: PCT/GB98/00879

(22) International Filing Date: 23 March 1998 (23.03.98)

(30) Priority Data:
9705926.5   21 March 1997 (21.03.97)   GB

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(81) Designated States: CA, JP, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: FORM DATA ENTRY WITH MATCHING OF THE FIELD TYPE
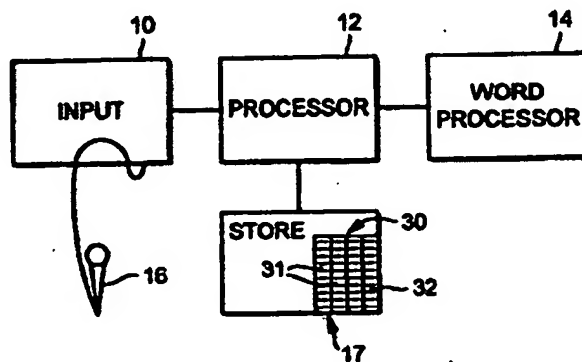
(57) Abstract

A data entry system comprises input means (10), preferably a voice recognition system, for the input of items of data and database means (17) for storing a plurality of records, each record consisting of one or more data items, each data item being defined as being in one of a number of data categories. The system includes means (12) for storing at least one document format or data entry form having at least one field for the addition of a data item from a predetermined category. Each data item input is compared with stored reference data (31) to find a match for the input data item, and, hence, to identify the data category to which the input data item belongs. The input data item is added to the document format or data entry form at a field associated with the data category so identified. The stored reference data may include at least one register (31) of information derived from the records stored in the database (17) means but separate from them. The system is very easy to use for unskilled users and, further, document formats and data entry forms in applications complying with the complement object model can easily be converted to such a system using a suitable Active X control.

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FORM DATA ENTRY WITH MATCHING OF THE FIELD TYPE

The present invention relates to an improved system for
document completion or form filling in the context of a
word-processing system or for the entry of data into a
database.

Many word-processing and computer systems currently
available offer a facility for inserting data from a
computer record of some kind into a standard document
format. Operations of this kind range from simply adding
name and address details to a standard letter which is to
be sent to a number of different addressees to inserting a
large number of items of data into a complicated document
format, for example, completing a patient's hospital
record. In this specification, the term 'document' is to
be taken to cover any file stored on a computer or word-
processor or in a database, into which one or more items
of data from a separate database are to be inserted to
form a complete file for printing, display or further
storage.

One difficulty with systems of this kind hitherto is that
they may be relatively complicated to use, requiring
skilled operators and careful input of information. It is,
however, a well-recognised fact that the introduction of
personal computers and word-processing systems has led to
much more widespread generation of documents by relatively
unskilled operators, for example, professionals of various
kinds including doctors and lawyers, many of whom have
little training in using such systems. It would be
desirable, therefore, to provide a document generation
facility in word-processing or computer systems which is
easy for an unskilled operator to use.

Similar problems arise in connection with the entry of
data into a database or other structured computer memory;

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data must be input into the correct field in the correct
record. To facilitate entry of data into such databases
and the like storage, many systems use a graphical user
interface (GUI) which provides a screen display having the
5   appearance of a form to be completed; the user selects,
with the aid of a mouse or in some other way, the
appropriate box into which text or other data can be
inserted. While the screen has the appearance of a
document, no file containing both the 'document format'
10   and the inserted data is ever generated. Instead, data is
simply entered into the database fields represented
graphically on screen by each box selected by the user
prior to entry of the data items added to the database
record. A graphical display of this kind, which leads to
15   entry of data into a database rather than generation of a
document will be referred to as a 'form' in this
specification and its appended claims.

In accordance with a first aspect of the invention, there
is provided a data entry system comprising:
20   input means for the input of items of data;
database means for storing a plurality of records,
each record consisting of one or more data items, each
data item being defined as being in one of a number of
data categories;
25   means for storing at least one document format or
data entry form, the document format or data entry form
having at least one field for the addition of a data item
from a predetermined category; and
means for receiving a data item input at the input
30   means and for comparing it with stored reference data to
find a match for the input data item, and, hence, to
identify the data category to which said input data item
belongs; said means for receiving being operable to add
the input data item to the document format or data entry
35   form at a field associated with the data category so
identified.

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In a preferred embodiment, the stored reference data comprises at least one register of information derived from at least some of the plurality of records stored in the database means but separate from them. This has the
5   advantage over using the records in the database means themselves for reference purposes that a more sophisticated search package can be used to generate and search the register or registers, allowing speedier operation and more efficient comparison.

10 Preferably, the data entry system comprises at least one register of commands; the means for receiving a data item input at the input means being operable to compare the said data item with the content of the register of commands to find a matching item and, hence, to identify
15 commands input at the input means. With this arrangement, the user can simply input data and commands without the need to identify commands to the system, making the system easier for an unskilled user to use.

In a preferred form, the input means includes a voice
20 recognition system capable of converting audible speech into electrical signals suitable for input to the means for receiving data items.

Voice recognition systems are in increasingly widespread use as an easy means for using computers or other
25 electronic systems. In general, they permit the user to speak commands to the device in question. When incorporated into direct dictation systems, they also allow the user to dictate text directly into a word-processing system without the need for a keyboard or an
30 intermediary skilled in typing. It will be appreciated that such systems allow input of two kinds; direct commands, for example, OPEN FILE, which cause operation of

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programs, and text or data, which is to be added as such
to documents or records.

In a further aspect the invention provides a method of
generating a data entry system of the kind described above
for a particular application, the method comprising
analysing a pre-existing document format or data entry
form used in the said application to identify and
characterise fields provided for the addition of data and
to generate additional code for inclusion in operating
software under which the application is to run and/or the
application software for the application under which data
is to be entered, and adding the code generated to the
operating and/or application software, respectively; the
added code acting in use to cause comparison of each input
data item with the stored reference data and to add the
input data item to the document format or data entry form
at a field associated with the data category identified.

In a third aspect the invention provides an Active X
control as described below for use in generating a data
entry system for a particular application.

An embodiment of such a system will now be described in
detail, by way of example, with reference to the drawings,
in which :

Figure 1 is a schematic diagram of a system in
accordance with he invention;

Figure 2 illustrates schematically storage of records
comprising a plurality of data items; and

Figure 3 shows schematically a document or form.

A preferred embodiment of a system in accordance with the
invention comprises a direct dictation unit 10 including a

voice recognition system, a processor 12 which interfaces
with both the direct dictation unit 10 and with a word-
processor or database storage 14 or both. In practice, the
three units 10, 12 and 14 may effectively be implemented
5   using the processor of a single personal computer ('pc'),
for example, a 486 series pc or a pc containing a pentium
processor supplied by Intel Corporation provided with 16
or 32 Mb of RAM and 30 Mb of hard disc space. In addition,
the system requires a suitable microphone 16, for example,
10   the microphone supplied by Talking Technologies under the
trade mark 'TALK MIC' which is particularly suitable for
use in voice activated or direct dictation systems since
it is capable of transmitting accurately the user's voice
without corruption and free of extraneous background
15   noise.

The direct dictation unit 10 which is used for voice
activation of the system may, for example, be implemented
by using one of a number of commercially available
software packages, for example, IBM Voicetype, supplied by
20   IBM Corporation, or Kurzweil Voice, supplied by Xerox
Corporation and a suitable pc. These packages transform
the input from the microphone 16 into input capable of
recognition by the word processing system being used to
generate the finished document or by data input software
25   accessed by means of a form of the kind described above.

The system is particularly advantageous when used in
combination with stored data held in computer memory 17,
for example, a conventional database or other organised
memory of some kind. The database may be used to store
30   data, for example, lists of patients' names and addresses,
dates of birth, and the like.

The database 17 may be associated with one or more
documents of a word-processing system, as a source of
external data, or may be associated with one or more

forms, by means of which data can be added to the database
or both. In a preferred embodiment, the screen of the pc
may carry a display which serves both functions; the
display may represent the format of a document, which can
5   be printed off or stored as a complete file for further
use, while, at the same time, functioning as a form for
data entry.

As is usual in commercially available databases, items of
data of different types or categories may be associated or
10   linked to form a single record 18. This can best be
explained by likening the database to a grid of boxes or
fields capable of storing information, as shown in Figure
2. Each row 19 of boxes (or 'record') may be used to store
information about a single individual, each column 20
15   storing information of a particular type (or 'data
category'), for example, dates of birth for a plurality of
individuals.

To use the system the user calls up a standard form, if
data is to be entered, or document, which may be a letter
20   or other document template. In either case, the form or
document template 22 comprises of a number of boxes or
fields 23 into which information of a particular kind is
to be entered, in a similar manner to completing a
conventional paper form. (See Figure 3). Data and commands
25   can be input using the voice recognition unit 10 or, more
conventionally, by using a keyboard (not shown).

The user can then start to add data to the document or
form 22 by inputting data using the voice recognition unit
10.

30   It is to be noted that, whether we are considering data
entry or document generation, there are two different
situations which arise initially. In the first case, data
to form a completely new record is to be added to the

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document or form. In the second case, a record already
exists in the database and the first step towards data
entry is to select the desired record from those in the
database. However, once selection has taken place,
5   addition of data to an existing record can proceed in the
same manner as the addition of data to a newly created
record.

Where data is to be added to either a new record or to a
record already selected, the invention provides that it
10   is not necessary for the user to identify the category of
information being input. The processor 12 takes the input
from the voice recognition unit 10 and compares it with
stored data until it finds a match.

For example, if the data input is a patient's surname, the
15   processor 12 will compare the information which has been
inputted with the data items of a first category 20 within
the database, for example, it may first compare the
inputted surname with the column of data representing
addresses. It will not, of course, find a matching data
20   item in this first category and will then move on to
compare the inputted data with items stored in the second
category and so on.

When a matching item is found, the processor 12 causes the
information to be added by the word-processor 14 to the
25   selected document or form, inserting it at the appropriate
field or 'box' 23 according to the category or type 20 of
data item with which the processor 12 matched it. So, if
the inputted data item matches a surname held in the
database storage, the data will be added to the document
30   in the box 23 which corresponds to the patient's surname
on the form.

Although it is possible to select the appropriate category
20 by searching against the database 17 itself, it is

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preferable to select the category by reference to separate
registries or indexes generated from the database 17 but
held separately in memory 30. This allows more
sophisticated and efficient indexing and searching
5   techniques to be employed.

For example, searching and indexing packages available may
permit the grouping or clustering or terms, in effect, a
two-tier indexing allowing terms to be grouped together,
for example, all conditions affecting the eye might be
10   grouped or 'clustered' within the registry 31 or index for
'diagnoses' so that once it has been determined that a
particular patient suffers from an eye problem, a match is
sought only among those conditions which affect the eye. A
separate registry 31 may be stored for each data category
15   20, some will in effect be a simple alphabetical or
numeric listing of all data items in a category, others
may be more complex. In addition, some registries may
contain purely numeric data, for example, dates of birth,
and others alphabetic data. Using suitable software for
20   searching and indexing, the system can recognise, for
example, purely numeric data, and will consequently not
look for a match in categories containing alphabetic
information.

Each registry 31 will, however, be associated with a
25   single data category so that, if a match is found, it
should in most cases provide a clear indication as to the
category to which data should be added.

Because more sophisticated procedures can be used with a
separately generated registry 31 than with the database
30   itself, matching of a data item with an existing data
entry can be achieved more quickly.

Once the first input data item has been matched and added
at the appropriate location in the document or form, the

user can input further items of data using the voice
activation unit 10, each further data item being checked
by the processor 12 against stored information in either
the database 17 itself, or, preferably, the registries
5   held in the memory 30. Once a match has been found, each
additional data item can be added to the document or form
22 at the appropriate location 23.

Where data is to be added to an existing record 19 in the
database 17 or a document is to be generated by importing
10   data from an existing record 19 into a document template
cr where, as is preferred, the two operations are to be
combined, the first step will, of course, be to select the
required record 19. This can be achieved by using the same
data matching procedure as is described above in
15   connection with selection of an appropriate data category
20. Most users will, for speed, select a data item which
is unique or nearly unique to a particular record 19, for
example, the patient's surname. However, the user might
only be able to recall a data item from the required
20   record of the kind likely to give rise to multiple matches
during the checking operation. In this instance, it can be
arranged that the software causes all records containing a
matched data item to be displayed so as to allow the user
to select the required record 19. Alternatively,
25   particularly in the case where separate structured
registries are used for matching purposes, it is possible
to arrange for matching against two or more input data
items: a logical AND operation. For example, a doctor
might recall simply that a patient whose record is to be
30   updated, was admitted on a particular date with a
particular condition. Using suitable search software it is
straightforward to locate a record which contains data
items matching the admission ate and the patient's
condition.

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As indicated above, once a record has been selected,
additional data items can be added to the record in
precisely the same manner as they are added to new
records; each input item being checked against stored data
to identify the appropriate data category 20 in which the
item should be placed.

Preferably, the system is such that identification of the
required record 19 in the database by the processor 12
causes the all data items from that record 19 for which
there are corresponding boxes or locations 23 on the
displayed form or document 22 to be displayed at the
appropriate locations 23 in the document or form 22
automatically. Thus, in the example given, if the database
storage also holds details of a patient's forenames,
address, date of birth and doctor's name, these items can
be added to the form 22, if the form has appropriate
fields 23 for entry of these data items, automatically on
finding a match for the input data item in a record held
in the database 17.

The document or form 22 may include further fields or
boxes 23 to which free text can be added by the user at
will, using the voice activation or direct dictation unit
10. Thus, for example, the document or form might, in the
example referred to above, include one or more fields into
which a patient's case notes may be added by dictation.

In addition to data items, the voice recognition system or
other input means 10 may also allow the user to input
commands for navigating around the document or form 22
directly, for closing a particular operation or
application or for selecting another form or document. It
is possible, using the system of indexes or registries
described above to avoid any need for the user to
distinguish commands from other spoken input to the
system.

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The stored data held in the memory 30 may include a
registry 32 of command words so that if the input is
matched against an item in the commands registry 32 it is
treated by the system as a command not as text or other
5   data to be matched. The registry of commands might, for
example, include words such as 'up', 'down' and 'next', as
well as labels identifying particular fields 23, such as
'surname', 'doctor', 'd.o.b' used for moving from field to
field 23 within a chosen form or document. It might also
10   include a list of document and/or form names to enable the
user to select the required form or document easily.
Finally, the commands registry 32 might include more
general commands such as 'open', 'close' or 'print' which
can be used with any form or document.

15   Whilst the systems described above have been described in
connection with the input of data using a voice activation
or direct dictation unit, it will be appreciated that
other forms of input could also be used, for example, a
conventional computer keyboard.

20   The system described allows for very easy and quick
completion of documents and forms for printing or addition
of data to database systems and records for storage by
unskilled users, lessening or eliminating errors due to
operator errors(bias) and making data entry consistent by
25   permitting specific data items to be entered always in the
same manner and format.

In the context of many widely used software packages,
existing forms can easily be customised to function in
this way, in particular, those defined using graphical
30   user interface packages such as Visual Basic, Delphi, C++
or other software compatible with 'Active X' technology.

The Active X Technology has developed from a tool
previously known as object linking & embedding - OLE -

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widely used by software developers to provide specific
capabilities not available within the development
environment. Such capabilities can be engineered by
writing specific instructions to the computer's operating
5   system or to other applications and then encapsulating
these as a tool that 'plugs and plays'.

For example, it might be appropriate to insert a
spreadsheet generated using one software package into a
document generated using a word processing package having
10   no spreadsheet capability. This could be achieved using
the OLE technology which would allow the provision of
specific instructions, recognisable by the operating
system and by the word processing and spreadsheet
software, the instructions effectively calling the
15   spreadsheet package from within the word processing
package and closing the spreadsheet package down again
once it's use within the word processing software has been
completed.

However, although the Active X technology permits the same
20   object linking as was previously possible through OLE, it
is a much broader concept and encompasses a much wider
functionality, automating several tasks in one or more
applications and having them called from another.

The Active X technology is a medium for creating simple or
25   complex objects, applying properties to them, giving them
methods, raising events and then providing a common shell
of functionality and connectivity to the development space
of the development programming language. Because the
Active X technology consists of consistent methods which
30   are recognised by major development languages as well as
the operating systems found in a pc environment, the
Active X technology allows for better communication and
connectivity than was possible with OLE. Most major

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software suppliers now write their software products to be compatible with Active X technology.

In general, the term 'object' is used to describe any virtual or abstract item which is capable of having
5   properties, and methods and raising events. For example, an application package like Microsoft Word is an object, as is a spreadsheet or a collection of data cells (a database), a single data cell or a text box. However, in the context of Active X technology, the term 'object' is
10   limited to those objects, sometimes referred to as 'component objects' or 'window objects' which meet the requirements of a standard known as the Component Object Model ('COM').

The COM requires:
15   1.   A common way for applications to access and perform operations on objects.
                2.   A mechanism for keeping track of whether an object is in use and for deleting the object when it is no longer needed.
20   3.   A standard error reporting mechanism (instead of error codes and values).
                4.   A mechanism for applications to exchange objects.
                5.   A means for identifying objects and associating
25   them with applications able to understand how those objects are implemented.

Using a component model application, there are no particular difficulties in determining how to handle methods, properties or events since these are called by
30   reference to standard conventions automatically.

The specific instructions generated in the Active X technology to allow manipulation of objects meeting the COM standard are called 'controls'.

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In the present case, the Active X control we have
developed analyses the form or document in great detail
and writes 'script codes' which allow the input means, for
example, the voice recognition software referred to above,
5   to communicate with the form or document without any
skilled user involvement.

As set up in, for example, Visual Basic, a form consists
of a plurality of 'controls' which consist of defined
'events', 'properties' and 'methods'. Events are actions
10   built into the form; they may self-refer or may act on
other events by means of 'methods', eg, 'open', 'close' or
'click'. 'Properties' relate to name, size and other
similar descriptors. Examples of events are:

     Form = load
15   Text 1= gotfocus
     Data 1 = error
An example of a method is:
      Richtextbox1.loadfile

For each form, the Active X control analyses the content
20   of the form, its structure, the relationships between the
contents of the form, and the relationship between the
content of the form and any associated database. This is
possible because the development software, in the example
given, Visual Basic, complies with the component object
25   model (COM). In particular, our Active X control
identifies all events within the form, all methods which
can be called and all properties which can be modified. It
also lists and names all controls within a given form and
their relative locations, which are generally defined by
30   reference to the control's 'tab' property.

The Active X control also analyses the controls
themselves, again identifying all events, methods or
properties associated with each control. any links between
the form and any associated database.

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Having thus analysed the form in detail, the Active X
control then performs a decision making process to
determine which items on the form need coding for
recognition by the input means, in the example given
5   above, voice recognition software. It then generates
codes automatically for the items selected by the decision
making process and inserts these codes into the voice
recognition software. These codes permit the input means
10   to recognise as commands input intended to enable
further actions to be taken, or as control and navigation
information allowing movement within the form or another
record, to another form or to close the form. In addition
codes are inserted into the voice recognition software to
allow the system to identify the locations on the form or
15   document 22 where converted speech input should be placed
as text.

Thus, when the voice recognition software is selected by
the user, the voice recognition software will have in its
stored list of recognised commands all the words which
20   will be needed to navigate around a form, select a
particular location for entry of text or enter the text
itself within selected locations on the form.

For example, if there is an input field 23 on the form or
document 22 identified to the user by the label
25   'diagnosis', then the user can select the required field
simply by speaking the word 'diagnosis'; the codes
necessary for this will have been generated and inserted
into the voice recognition software by the Active X
control after the form has been analysed and an input
30   field labelled 'diagnosis' identified by the control on
the form or document. It will be appreciated that this is
latter step is, in fact, a two-fold step; firstly, the
code for recognition of the spoken word 'diagnosis' must
be added, and, secondly, a command to move to that field
35   within the form must be added so that every time the word

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is recognised the application enters any text or data
following in the correct field.

The Active X control may, in addition, automatically
generate codes for inclusion in the commands registry 32
5   or in the registries 31 or indexes used as described above
to allocate input data to the correct data category 20 in
a given record 19. So, as each data item is input it will
be checked against existing entries and, if none is found,
the Active X control will cause the required code for the
10   new entry to be added to the relevant register for that
data category once the user has identified it.

The Active X control is equally effective whether the
template under analysis is a document for completion and
printing or a data entry form for the input of data to a
15   database or other record system. It will operate on any
form or document generated using development software
compatible with Active X technology.

CLAIMS

1.   A data entry system comprising:
      input means for the input of items of data;
      database means for storing a plurality of records,
5   each record consisting of one or more data items, each
      data item being defined as being in one of a number of
      data categories;
      means for storing at least one document format or
      data entry form, the document format or data entry form
10   having at least one field for the addition of a. data item
      from a predetermined category; and
      means for receiving a data item input at the input
      means and for comparing it with stored reference data to
      find a match for the input data item, and, hence, to
15   identify the data category to which said input data item
      belongs; said means for receiving being operable to add
      the input data item to the document format or data entry
      form at a field associated with the data category so
      identified.

20   2.   A data entry system according to claim 1 wherein the
      stored reference data comprises at least some of the
      plurality of records stored in the database means.

      3.   A data entry system according to claim 1 wherein the
      stored reference data comprises at least one register of
25   information derived from at least some of the plurality of
      records stored in the database means but separate from
      them.

      4.   A data entry system according to any preceding claim
      wherein the means for receiving an input data item is
30   operable to comparing the input data item with stored
      reference data to find a match for the input data item,
      and, hence, to identify a record stored in the database
      means.

5.   A data entry system according to claim 4 in which
identification of a record causes one or more additional
data items from the record in which the matching item is
held to be added to the document format or data entry form
at fields dependent on the categories of the said one or
more additional items.

6.   A data entry system according to any preceding claim
comprising at least one register of commands; the means
for receiving a data item input at the input means being
operable to compare the said data item with the content of
the register of commands to find a matching item and,
hence, to identify commands input at the input means.

7.   A data entry system according to any preceding claim
wherein the input means includes a voice recognition
system capable of converting audible speech into
electrical signals suitable for input to the means for
receiving data items.

8.   A data entry method comprising:
       storing in database means a plurality of records,
each consisting of one or more data items, each data item
being defined as being in one of a number of data
categories;
       storing at least one document format or data entry
form, each document format or data entry form having at
least one field for the addition of a data item from a
predetermined category;
       inputting of an item of data; and
       receiving an input data item; comparing the input
data item with stored reference data to find a match for
the input data item, and, hence, identifying the data
category to which said input data item belongs; and adding
the input data item to the document format or data entry

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form at a field associated with the data category so
identified.

9.   A data entry method according to claim 8 wherein the
input data item is compared with stored reference data
comprising at least some of the plurality of records
stored in the database means.

10.   A data entry method according to claim 8 wherein the
input data item is compared with stored reference data
comprising at least one register of information derived
from at least some of the plurality of records stored in
the database means but separate from them.

11.   A data entry method according to any of claims 8 to
10 wherein an input data item is compared with stored
reference data to find a match for the input data item,
and, hence, to identify a record stored in the database
means.

12.   A data entry method according to claim 11 in which
identification of a record causes one or more additional
data items from the record in which the matching item is
held to be added to the document format or data entry form
at fields dependent on the categories of the said one or
more additional items.

13.   A data entry method according to any of claims 8 to
12 further comprising storing at least one register of
commands; and comparing an input data item with the
content of the register of commands to find a matching
item and, hence, to identify commands input at the input
means.

14.   A data entry system according to any preceding claim
wherein data items are input orally by means of a voice
recognition system capable of converting audible speech

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into data items capable of comparison with stored
reference data.

15.   A method of generating a data entry system in
accordance with claim 1 for a particular application, the
method comprising analysing a pre-existing document format
or data entry form used in the said application to
identify and characterise fields provided for the addition
of data and to generate additional code for inclusion in
operating software under which the application is to run
and/or the application software for the application under
which data is to be entered, and adding the code generated
to the operating and/or application software,
respectively; the added code acting in use to cause
comparison of each input data item with the stored
reference data and to add the input data item to the
document format or data entry form at a field associated
with the data category identified.

16.   A method according to claim 15 in which the code
generated also causes at least one register of information
to be derived from at least some of the plurality of
records stored in the database means for comparison with
input data items, the code acting in use to add to the
said register of information as each subsequent data item
is input.

17.   A method according to claim 15 or 16 in which the
application is a component object model application and
the document format or data entry form is analysed and
code for addition to the operating and/or application
software generated by means of an Active X control as
hereinbefore defined.

18.   An Active X control as hereinbefore defined for use
in generating a data entry system in accordance with claim
1 for a particular application.
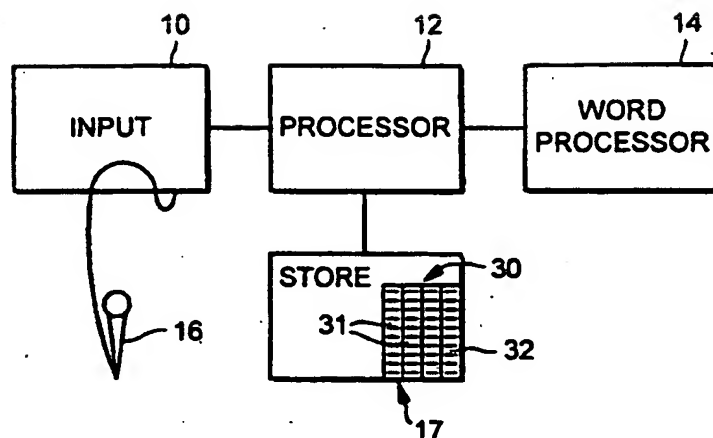
FIG. 1

ADDRESS	SURNAME	FORENAME(S)	DATE OF BIRTH	DOCTOR	etc
xxx xxx	ADAMS	ANNE	N.N.NN		
yyy yyy	BROWN	BRIAN	etc		
zzz zzz	CLARK	COLIN	etc		
etc etc	DAWES	DAVID	etc		
etc etc	EVANS	EDWARD	etc		

FIG. 2

SURNAME [   ]   FORENAME(S) [   ]

ADDRESS [   ]   23

DOCTOR'S NAME [   ]

DATE OF BIRTH [   ]

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FIG. 3

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6   G06F17/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6   G06F   G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 96 13009 A (HO) 2 May 1996 see page 5, line 23 – page 6, line 23	1-4, 6-11,13, 14
X	EP 0 598 598 A (CANON) 25 May 1994 see column 2, line 19 – line 39 see column 8, line 42 – column 9, line 20	1,6-8, 13,14
A	US 5 168 548 A (KAUFMAN ET AL) 1 December 1992 see column 2, line 4 – line 12 see column 2, line 28 – line 30 see column 2, line 61 – column 3, line 2	1-18
A	EP 0 607 615 A (TOSHIBA) 27 July 1994 see abstract	15-18

☐ Further documents are listed in the continuation of box C.   ☒ Patent family members are listed in annex.

Date of the actual completion of the international search	Date of mailing of the international search report
21 July 1998	28/07/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Pottiez, M

Form PCT/ISA/210 (second sheet) (July 1992)

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